

WHAT IS CLAIMED IS:

AI >

1. A thin-film magnetic head comprising:  
a lower core layer;  
a gap layer formed on the lower core layer, optionally  
with a lower pole layer therebetween;  
an upper pole layer formed on the gap layer;  
an upper core layer formed on the upper pole layer; and  
a Gd-defining layer for defining the depth in the  
height direction of the joint surface between the gap layer  
and the upper pole layer, the Gd-defining layer being formed  
on the lower core layer toward the back in the height  
direction from a surface facing a recording medium,

wherein the width in the track width direction of the  
gap layer is smaller than or equal to the width in the track  
width direction of the upper pole layer when viewed from the  
surface facing the medium.

2. A thin-film magnetic head according to Claim 1,  
wherein the width in the track width direction of the gap  
layer is smaller than or equal to the width in the track  
width direction of the upper pole layer and the width in the  
track width direction of the lower pole layer when viewed  
from the surface facing the medium.

3. A thin-film magnetic head according to Claim 1,  
wherein the width in the track width direction of the gap

layer is smaller than or equal to the width in the track width direction of the upper pole layer, and the width in the track width direction of the lower pole layer is substantially equal to the width in the track width direction of the gap layer when viewed from the surface facing the medium.

4. A thin-film magnetic head according to Claim 1, wherein the minimum width in the track width direction of the gap layer is  $0.4\ \mu\text{m}$  or less when viewed from the surface facing the medium.

5. A thin-film magnetic head according to Claim 1, wherein the thickness of the lower pole layer is in the range of  $0.25$  to  $0.5\ \mu\text{m}$ .

6. A thin-film magnetic head according to Claim 1, wherein the Gd-defining layer extends from both sides of a pole section comprising the gap layer, the upper pole layer, and optionally, the lower pole layer, and each of the extending sections of the Gd-defining layer has a width of  $0$  to  $4\ \mu\text{m}$ .

7. A method for making a thin-film magnetic head comprising:

a step of forming a Gd-defining layer on a lower core layer so as to recede from a surface facing a medium in the

10017748-121401

A2  
CONT'D

A2  
CONCL. height direction by a gap depth;

a step of forming a pole section comprising a gap layer formed on the lower core layer, optionally with a lower pole layer therebetween, and an upper pole layer formed on the gap layer; and

a step of etching for performing dry etching on both sides of the pole section when viewed from the surface facing the medium,

wherein, in the step of forming the Gd-defining layer, each extending section of the Gd-defining layer extending from either side of the pole section is set so as to have a predetermined width.

8. A method for making a thin-film magnetic head according to Claim 7, wherein the width of each extending section of the Gd-defining layer is set in the range of 0 to 4  $\mu\text{m}$ .

9. A method for making a thin-film magnetic head according to Claim 7, wherein the width of each extending section of the Gd-defining layer is set in the range of 1 to 4  $\mu\text{m}$ .

10. A method for making a thin-film magnetic head according to Claim 7, further comprising, after the step of forming the pole section, a step of adjusting the width of each extending section of the Gd-defining layer to a

predetermined length.

11. A method for making a thin-film magnetic head according to Claim 10, wherein, in the step of adjusting the width of each extending section of the Gd-defining layer, the width of each extending section is adjusted to the predetermined length by one of reactive ion etching and O<sub>2</sub> ashing.

12. A method for making a thin-film magnetic head according to Claim 7, wherein, in the step of forming the pole section, the lower pole layer, the gap layer, and the upper pole layer are deposited by plating in that order.

13. A method for making a thin-film magnetic head according to Claim 7, wherein, in the step of forming the pole section, the gap layer and the upper pole layer are deposited in that order.

14. A method for making a thin-film magnetic head according to Claim 7, wherein, in the etching step, the ion irradiation angle is set at 45° to 75° with respect to the direction perpendicular to the lower core layer.

15. A method for making a thin-film magnetic head according to Claim 14, wherein, in the etching step, the ion irradiation angle is set at 55° to 70° with respect to the

10017748-121401

direction perpendicular to the lower core layer.

ADD A3

10017748.121401